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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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David Silverstein Andover-IP-Law Suite 300 44 Park Street Andover, MA 01810				
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EXAMINER				
YAMNITZKY, MARIE ROSE				
ART UNIT		PAPER NUMBER		
1794				
MAIL DATE		DELIVERY MODE		
10/05/2009		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/540,733

**Applicant(s)**

KATHIRGAMANATHAN ET AL.

**Examiner**

Marie R. Yamnitzky

**Art Unit**

1794

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 20 July 2009 and 28 August 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 74, 76-83 and 85-103 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 74, 76-83 and 85-103 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 August 2009 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsman's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submissions filed on July 20, 2009 and August 28, 2009 have been entered.

2. The amendment filed July 20, 2009 amends the specification, amends claims 74, 76-83 and 87-90, cancels claims 75 and 84 and adds claims 91-103.

Claims 74, 76-83 and 85-103 are pending.

3. The replacement sheet of drawings filed August 28, 2009 makes corrections to Fig. 16b and Fig. 16c.

4. The rejections under 35 U.S.C. 112, 1<sup>st</sup> and 2<sup>nd</sup> paragraphs, as set forth in the Office action mailed February 18, 2009 are overcome by amendment.

The rejections under 35 U.S.C. 103(a) as set forth in the Office action mailed February 18, 2009 are withdrawn subject to clarification of the issues raised in this Office action with respect to the HOMO and LOMO limitations recited in the present claims. The applicability of the previously applied art will be reconsidered upon clarification as to whether "LOMO" should

read --LUMO-- and as to whether the relative limitations refer to relative levels or to relative energies.

5. Claims 74, 88, 91 and 103 as amended/added July 20, 2009 require that the HOMO of the second complex be higher than the HOMO of the first complex, and require that the LOMO of the second complex be lower than the LOMO of the first complex. Applicant refers to the paragraph bridging pages 2 and 3 of the specification for support for these claim limitations. The examiner notes that while the specification paragraph refers to relative HOMO and LOMO of “the metal” of the second and first complexes, rather than to the relative HOMO and LOMO of the complexes as recited in the claims, the “M” of HOMO and LOMO stands for “molecular” and would not generally be used in reference to an atom; i.e. it would be used in reference to the complexes as a whole rather than in reference to the metal per se.

Applicant also amends the paragraph bridging pages 2 and 3 by changing “second” to --first-- in the penultimate line of the paragraph, and sets forth the same relationship in claims 74, 88, 91 and 103. Applicant states that this corrects an obvious typographical error. The examiner respectfully disagrees for reasons set forth later in this Office action.

6. The oath or declaration is defective. A new oath or declaration in compliance with 37 CFR 1.67(a) identifying this application by application number and filing date is required. See MPEP §§ 602.01 and 602.02.

The oath or declaration is defective because:

It does not properly identify the foreign application for patent or inventor's certificate on which priority is claimed pursuant to 37 CFR 1.55, and any foreign application having a filing date before that of the application on which priority is claimed, by specifying the application number, country, day, month and year of its filing.

The declaration filed July 27, 2005 identifies two foreign priority applications. The first of the two applications is identified as Application Number 0230074.4 whereas the corresponding priority document from the International Bureau is Application No. 0230074.7 (emphasis added).

7. The amendment filed July 20, 2009 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows:

The change from "second" to --first-- in the penultimate line of the paragraph bridging pages 2 and 3 is not clearly supported by the application as originally filed.

The originally filed text of the paragraph bridging pages 2 and 3 obviously contained an error in comparing the HOMO and LOMO for "the metal in the second...complex" and "the metal in the second...complex". However, it is not clear from the original disclosure whether the error was in the first occurrence of "second" or in the second occurrence of "second". That is, it is not clear from the original disclosure whether the correction made by applicant in the amendment filed July 20, 2009 is correct, or whether "second" should have been changed to --first-- at page 2, line 30, of the original specification.

The only explicit teachings regarding HOMO and LOMO in the original disclosure are those set forth in the paragraph bridging pages 2 and 3. The examiner notes that the LOMO of a material is not a molecular orbital that is generally taken into consideration in the art. The teachings regarding HOMO and LOMO follow teachings regarding band gap. Given applicant's preceding discussion of band gap, it is unclear if applicant's teaching of LOMO should actually refer to LUMO (lowest unoccupied molecular orbital). Band gap is the difference between HOMO and LUMO, not the difference between HOMO and LOMO.

Specifying the relationship between HOMOs of two materials and/or between LUMOs of two materials in terms such as "higher" and "lower" can also be problematic when it is not clear whether it is the HOMO (or LUMO) levels that are being compared, or whether it is the HOMO (or LUMO) energies that are being compared. HOMO (or LUMO) level is inversely related to HOMO (or LUMO) energy. That is, if material A has a higher HOMO level than material B, material A has a lower HOMO energy than material B.

In the present case, given the original disclosure as a whole, it cannot be determined with certainty what was meant/intended by the HOMO and LOMO teachings in the paragraph bridging pages 2 and 3 (as originally filed or as presently amended).

Applicant is required to cancel the new matter in the reply to this Office Action. (If applicant has information pertaining to the HOMO, LUMO and/or LOMO of the metal complexes utilized in the working examples that might provide support for making clarifying amendments to the paragraph bridging pages 2 and 3, the examiner suggests that such information be provided in the form of a Rule 132 Declaration.)

8. Claims 74, 76-83 and 85-103 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

It is not clear from the original disclosure whether the inventor(s), at the time the application was filed, had possession of the claimed device(s) in which the HOMO of the second complex is higher, and the LOMO of the second complex is lower, than those of the first complex.

9. Claims 83, 99 and 103 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claims contain subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Gd(DBM)<sub>3</sub>Phen as required by claims 83, 99 and 103, wherein “Phen” is phenanthrene, is not enabled and therefore the devices as claimed in claims 83, 99 and 103 are not enabled.

In the Office action mailed February 18, 2009, the examiner included a section directed to claim interpretation with respect to various abbreviations set forth in the claims. The examiner noted that page 5, line 19 provided the definition of “Phen” as phenanthrene, but that phenanthrene is not within the scope of any of the formulae set forth in the specification as examples of L<sub>a</sub> or L<sub>p</sub>. Upon reconsideration, the examiner rejects those claims requiring

Gd(DBM)<sub>3</sub>Phen because the specification does not enable one skilled in the art to make the complex given the meaning of Gd, DBM and Phen as originally disclosed. Gd is gadolinium, which has an oxidation state of +3. Gd(III) is disclosed as a preferred metal at page 3, line 10. DBM is dibenzoyl methane (specification p. 21, l. 8-9), which is a  $\beta$ -diketone ligand within the scope of formulae (I) and (II) as shown on page 9. Presuming that Gd of Gd(DBM)<sub>3</sub>Phen is Gd(III), either "Phen" must be a neutral ligand or the complex must have an overall charge because each DBM ligand has a -1 charge. Phenanthrene is not a neutral ligand and there is no indication in the original disclosure that there is an overall charge on the complex Gd(DBM)<sub>3</sub>Phen. Alternatively, if "Phen" means phenanthrene and there is no overall charge on the complex, then the oxidation state of Gd must be higher than +3 and, to the best of the examiner's knowledge, Gd does not have an oxidation state higher than +3. (A similar inconsistency exists with "Phen" as phenanthrene for Gd(tmhd)<sub>3</sub>Phen, which is used in the device of Example 1 of the specification. The ligand "tmhd" is also a  $\beta$ -diketone ligand within the scope of formulae (I) and (II) as shown on page 9, and each tmhd ligand has a -1 charge.)

The examiner notes applicant's comments regarding ligands defined by reference to substituent groups R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub>. While the specification states that these R variables can form substituted or unsubstituted fused aromatic ring structures, these R variables are part of formulae that, as a whole, do not encompass phenanthrene per se. Phenanthrene consists of three fused benzene rings. Phenanthrene consists of carbon and hydrogen, but none of the ligand formulae set forth in the original disclosure consists of carbon and hydrogen. (Based on art of record, the



abbreviation “phen” is sometimes used to refer to a phenanthroline ligand, which is a neutral ligand within the scope of formula (XIV) as shown on page 15 of the specification.)

10. Claims 74, 76-83 and 85-103 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claims require that the highest occupied molecular orbital (HOMO) of the second complex be higher than the HOMO of the first complex, and require that the lowest occupied molecular orbital (LOMO) of the second complex be lower than the LOMO of the first complex. It is not clear from the original disclosure if the HOMO and LOMO limitations pertain to HOMO and LOMO levels, or to HOMO and LOMO energies. There is an inverse relationship between a molecular orbital level and the corresponding molecular orbital energy such that a higher level has a lower energy. Accordingly, the distinction is critical for determining the scope of the claims.

The limitations with respect to LOMO are also unclear because the LOMO of a material is not a molecular orbital that is generally taken into consideration in the art whereas the LUMO of a material is. It is not clear if “lowest occupied molecular orbital (LOMO)” should instead read “lowest unoccupied molecular orbital (LUMO)–”.

11. Applicant is advised that should claim 83 be found allowable, claim 103 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an

application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

12. Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (571) 272-1531. The examiner works a flexible schedule but can generally be reached at this number from 7:00 a.m. to 3:30 p.m. Monday and Wednesday-Friday.

The current fax number for all official faxes is (571) 273-8300. (Unofficial faxes to be sent directly to examiner Yamnitzky can be sent to (571) 273-1531.)

/Marie R. Yamnitzky/  
Primary Examiner, Art Unit 1794

MRY  
September 30, 2009